



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

- Albrecht, P.*—Ueber die cetoide Natur der Promammalia. Anatomischer Anzeiger. 1886. From the author.
- Dollo, L.*—Iguanodontidæ et Camptonotidæ. Comptes-Rendus. 1888. From the author.
- Branner, J. C.*—The Glacial Striæ of the Lackawanna-Wyoming Region.—Glaciation: its Relation to the Lackawanna-Wyoming Region. Both from the author.
- Billings, F. S.*—Swine Plague: its Causes, Nature, and Prevention. Bull. Agric. Exper. Station of Nebraska. 1888. From the author.
- Cook, A. J.*—Experiments with Insecticides. Agric. Coll. of Michigan. Bull. No. 39. From the author.
- Meyer, O.*—On Miocene Invertebrates from Virginia. Amer. Philo. Soc. 1888. From the author.
- Riley, C. V.*—On the Causes of Variation in Organic Forms. Address before the A. A. A. S., Cleveland. 1888. From the author.
- Armas, J. I. de.*—La Zoologia de Colon y de los primeros exploradores de America. From the author.
- McGee, W. J.*—Three Formations of the Middle Atlantic Slope. Amer. Jour. Science. 1888. From the author.
- Geikie, A. L.*—Report on the Recent Work of the Geological Survey in the Northwest Highlands of Scotland. Quart. Jour. Geol. Soc., Aug., 1888.
- Hauchecorne.*—Compte Rendu de la me. Session du Congrès Géologique International, Berlin. 1885. From the Secretary.
- Fritsch, A.*—Fauna der Gaskohle und der Kalksteine der Perm Formation Bohmens. Band II. Heft 3. Die Lurchfische, Dipnoit. 1888. From the author.

GENERAL NOTES.

GEOLOGY AND PALÆONTOLOGY.

VARIATIONS OF GRAVITY IN APPROACHING THE CENTRE OF ANY COSMIC SPHERE WHATEVER.—First, within a hypothetical hollow sphere, the solid shell of which is, in all parts, of equal density and of equal thickness, gravity at every point is in absolute equilibration. This results from two laws. First, gravity, relative to the same kind of matter, varies directly as the quantities. Let Q equal one quantity and q equal another; and G equal the gravity of Q , and g equal the gravity of q : then will $Q : q ::$

$G : g$, and there results $Q \times g = G \times q$, or $g = \frac{G \times q}{Q}$.

Now, if, in our hypothetical hollow sphere, we assume any point whatever, and draw a line through that point to the nearest and most distant points of the shell, this line will be a straight line, and the longest that can be drawn in the sphere; hence it passes through the centre, and is the diameter. Now, pass a plane through this assumed point and perpendicular to the diameter, cutting the shell into two segments, corresponding to the two segments of the diameter made by the assumed point.

Let R equal one segment of the diameter, and r equal the other; let Q equal the segment of the shell corresponding to R , and q equal the segment corresponding to r : then, since, by hypothesis, the density and thickness are everywhere equal, there results $Q : q :: R^2 : r^2$, and $Q r^2 = q R^2$; but gravity varies in proportion to the duplicate ratios of the reciprocals of distance, R and r . Let G represent the gravity of the segment $R^2 \times q$, and g represent the gravity of segment $r^2 Q$, at the assumed point, then we have $G :$

$g :: \frac{1}{R^2 q} : \frac{1}{r^2 Q}$; therefore, $G R^2 q = g r^2 Q$. Now, since $Q r^2$

$= q R^2$, $G = g$: *i.e.*, gravity, at any point whatever, in this hollow shell, is in absolute equilibration. Hence, in approaching the centre of any cosmic sphere, any point is in equilibration, relative to all the external shell; and gravity at any point is determined by the mass of the internal sphere, measuring from the point assumed to the centre for the radius of the internal sphere.

But the masses of spheres are directly proportioned to the triplicate ratios of their radii. Let R equal the radius of the cosmic sphere, and r equal the distance from the point assumed to the centre, *i. e.*, radius of the inner sphere. Let G equal the gravity on the surface of our cosmic sphere, and g equal the gravity at the

point assumed: then will result $G : g :: R^3 : r^3$; $g = \frac{G r^3}{R^3}$. At

the centre r equals 0 and $g = 0$. They vanish together.

As a matter of fact, however, this proportion and equation are true for two points only: *viz.*, at the surface, when $R = r$, and at the centre, when $r = 0$. Why? Because the density varies with the pressure, in the first place. Though the weight, *i. e.*, the gravity, relative to that sphere alone, is greatest at the surface, in the case of any given quantity of matter, yet, under the superincumbent pressure, the density of the inner sphere, composed of the same matter, is greater than that of the entire sphere.

Again, the heavier matter, *i. e.*, the matter of the highest specific gravity, during the process of free centralization, naturally forms the nucleus of the sphere, throwing the lighter materials to the surface, as we see in case of our earth. Thus, for two reasons, the

centres of all cosmic spheres are of higher specific gravity than the surfaces. On the contrary, after solidification has taken place, by virtue of thermal radiation into the infinite of space, the high degree of internal heat tends, very considerably, to diminish the density of the interior.

The complexity of this problem is not amenable to mathematic resolution. Even the elastic resiliency of the most persistent gases increases more rapidly than any assumed amount of pressure. Thus, if the pressure increases as the natural series 1, 2, 3, 4, etc., the elastic resilience is such that the resulting volumes are not $\frac{1}{1}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, etc., nor anything like it, except in the very lowest of the series. Still we are warranted in all cases in saying that the greater the pressure the greater the density for the same kind of matter.

Now, a few words on the formation of a solid crust over a molten sphere are entirely pertinent. It has been held by some authors that no crust can form over such a sphere; for, say they, *when the surface cools it is heavier than the molten mass within, and must necessarily sink; so that the centre would become solid first.* First, here is a palpable *reductio ad absurdum*; for this would necessarily result in cooling so as to solidify at the centre first. Can any rational mind accept this absurdity?

Second, ejected lavas always cool on the surface first, while yet the deeper portions are molten even so as to flow long after a solid crust has been formed. Thus does direct observation show the falsity of their hypothesis. No more need be said on that score.

Third, these authors neglect the fact that the lighter materials lie like a thick blanket around the outside of the sphere; and though they were to become frozen even, they could never sink into the molten heavier matter. Cold iron can not sink in molten gold. Cold silicon can not sink in molten iron. Yet, all the lighter materials are on and form the outside of earth, and of every other sphere where they exist. Unless there may exist a cosmic sphere of pure gold or pure platinum, or something of that kind, their hypothesis can never be realized.

Fourth, these lighter materials are highly non-conductive to heat, and hence husband the internal heat most providentially; so that earth will continue to have an internal heated core for raising mountains, continents, islands, etc., eons to come, as it thus far has had during eons past.

Fifth, the dream of those other philosophers, that all the waters of all the oceans will disappear to the centre of earth, cannot be realized, unless the outer non-conductive materials are in excess of the heavier central materials, which the higher mean gravity of earth seems to contradict.

Sixth, this fact of heavier central materials insures the molten condition of a portion of the centre, in spite of all contrary hypo-

theses. Through these heavier materials conduction is rapid, and the maximum is easily maintained. Mark! I say a portion of the centre, for the centre is unquestionably solid, as a resultant of pressure, the temperature being the maximum attained at the point of liquefaction. As the inner portion consists of the heavier materials, which are also far better conductors of heat, and rendered still better conductors under the immense pressure of the superincumbent materials, this solid nucleus will maintain, by conduction, this maximum temperature throughout. Finally, it may not be void of all interest to take a very brief view of earth's outer envelop.

The entire outer shell, as all know, consists mainly of two persistent gases—oxygen and nitrogen; oxygen, a constantly active, ever varying, yet constantly nearly the same in proportion; and nitrogen, a neutral dilutant for the active oxygen. With these two are mingled a few other substances, most conspicuous of which is watery vapor.

Next is a shell—a little broken—of water. This is followed, in the descending order, by a shell of mingled substances, the common rock materials. These are very poor conductors of heat. The lighter of these materials do not form a very thick mass. As the entire mass of earth, including all these, has a much higher specific gravity than any of these, it follows that heavier materials soon begin to take the place of these; nevertheless, this outer envelop must be sufficient to protect the heated nucleus, and volcanic emissions show that their seat is not below this outer shell, but in it. —*Ira Sayles, Ithaca, N. Y., March 12, 1888.*

(To be continued.)

THE ATTACHMENT OF PLATY CERATA TO FOSSIL CRINOIDS has been long known, but the hitherto extreme rarity of illustrative specimens has necessarily occasioned only brief explanatory remarks. Inasmuch as the gasteropod shell was invariably situated on the crinoidal vault, and covering the ventral opening, which was erroneously regarded as the mouth of the crinoid, conclusive evidence of the carnivorous habits of the crinoideans was thought to be established. Other explanations were from time to time offered, but for the most part they were also fallacious, and originated in wrong conceptions relative to the true functions of certain structures peculiar to the group of echinoderms. Opportunity has recently been offered for the examination of an extensive series of palæocrinoids with attached Platycerata, embracing numerous specimens of the following species: *Ollacrinus tuberosus* Lyon and C., *O. typus* Hall, *Physetocrinus ventricosus* Hall, *Strotocrinus regalis* Hall, *Dorycerinus immaturus* Wachsmuth and Springer, *Marsupiocrinus cælatus* Phil-

lips, *Eucladocrinus millebranchiatus* Wachs. and Sp., *Platycrinus hemisphæricus* M. and W., *Arthroacantha punctobrachiata* Williams, *Pterotocrinus acutus* Weth., *P. bifurcatus* Weth., *P. spatulatus* Weth., *Cromyocrinus simplex* Trauts., *Scaphiocrinus sp. und.* and *Actinocrinus verrucosus* Hall. It will be observed that in all the above species, with two exceptions, the vault is more or less depressed or nearly flat, with a simple anal opening, while in the last species mentioned the anal aperture is at the extremity of a prolonged anal tube—the so-called “proboscis”—but in this single instance the tube appeared to be injured, and probably has a second opening at the base. In every example, whether attached to the vault, as in the majority of the genera, or to the side of the calyx, as in *Platycrinus*, the molluscan shell is situated over the anal opening.

Summing up the predominant physiological and structural features suggested by recent investigations, it appears: (1) that the *Platyceras* was attached to the crinoid for a considerable length of time, and very probably for life, as is evidenced by the margin of the gastropod shell, corresponding exactly to the irregularities of the crinoidal surface—first suggested by Meek and Worthen; (2) that the anterior portion of the shell is always directly over the anal aperture of the crinoid, and that as growth in the shell continues the posterior margin is removed farther and farther from the vault opening, as is shown by the shallow concentric channels made by the margin of the shell in the vaults of *Strotocrinus* and *Physeocrinus*; (3) that the nourishment of the mollusc must have been derived chiefly from the excrementitious matter from the crinoid, though the gasteropod may have subsisted also on animalcules and microscopic plants, as in the case of the living representatives of the closely allied genus *Capulus*; (4) that the shape of the shell aperture and its marginal configuration were dependent entirely upon the surface of attachment, and hence are of small classificatory value; and (5) that the entire form of the shell was determined to a greater or lesser extent by the surface upon which the gasteropod was stationed.

The species of *Platyceras* in which the sedentary habits are positively known from the attachment of the gasteropod shells to crinoids are: *P. equilaterum* Hall, *P. infundibulum* M. and W., *P. parasiticus* Trauts., *P. erectum* Hall, *P. formosum* Keyes, *P. chesterense* M. and W., *P. dumosum* Conrad, and several undetermined species.—Charles R. Keyes.

GLYPTOCEPHALUS NOT IDENTICAL WITH BUCKLANDIUM.—In the AMERICAN NATURALIST for May and September, 1888 (Vol. XXII., pp. 448, 828), I have used the name *Bucklandium* (Koenig) as a substitute for *Glyptocephalus* of Agassiz (1843), the latter name

having been previously given to a well-marked existing genus of Pleuronectids by Gottsche (1835). I did this, as indicated in my communication (p. 828), solely on the authority of Pictet, who believed that the *Bucklandium* was the same as *Glyptocephalus* Agass.,¹ the work of Kœnig not being accessible to me at the time, and Prof. Pictet being recognized as a special authority on eocene fishes. But in the *Geological Magazine* for Oct., 1888 (p. 471), and also in *The Annals and Magazine of Nat. History* for Oct. (6 ser., v. II, p. 355), Mr. A. Smith Woodward, after an examination of the type of *Bucklandium diluvii*, "determined that it is truly the imperfect head and pectoral arch of a Siluroid." Incredible as such a malidentification on the part of Pictet must appear, I presume the determination of Mr. Woodward must be accepted, and, at any rate, that the name *Bucklandium* has nothing to do with *Glyptocephalus*. Consequently, a new name must be provided for *Glyptocephalus* Agass. *Glyptocara*, having the same meaning, may be employed.—*Theo Gill*.

Dr. C. A. White, of the United States Geological Survey, writes the senior editor as follows:—"I have just returned from Texas. I went to Baylor, Archer and Wichita counties, and found that Mr. Cummins was entirely correct in his reported discovery of Mesozoic and Palæozoic types of invertebrates commingled in one and the same layer of the Permian. I went with him to his localities, and collected with my own hands a good lot of the fossils. I shall support your published opinion—or rather determination—as to the Permian age of the formation."

THE NOMENCLATURE OF THE MAMMALIAN MOLAR CUSPS.—Every fresh discovery among the primitive mammals tends to confirm the theory that the evolution of the molar crowns has been, in a succession of stages, beginning with the single reptilian cone, the *homodont* type of Rüttimeyer (*Haplodont* Cope). Comparative anatomy and the palæontological record combine to demonstrate this proposition for all orders of mammals excepting the Monotremes, Multituberculates and Edentates—the history of the teeth of the former classes is incomplete. Our knowledge of the edentates leaves it uncertain whether the molar crowns are in a primitive or degenerate condition; we know that they once possessed enamel, but the analogical degeneration of the molar crowns among the cetacea from a complex to a primitive type makes any conjecture as to the crowns of the primitive edentates very doubtful. Excluding the representatives of the Multituberculata, Cope has shown

¹ Je crois que c'est [*i.e.*, "*Glyptocephalus radiatus* Agass."] la même espèce que celle qu'il a figurée dans les *Icones sectiles*, pl. 8, sous le nom de *Bucklandium*. Voyez [*Traité de Paléontologie par Pictet*], t. I., p. 144, et t. II., p. 66 [et p. 123].

that the tritubercular stage, in one form or other, is universal among the known lower Eocene Mammalia. In a recent memoir, I showed that a large proportion of the Mammalia of the Mesozoic period, again excluding the Multituberculates, were in the line of *trituberculy*, and a renewed examination of the English types removes every one of the apparent exceptions to this law. Among the American Jurassic types there are still several apparent exceptions.

In view of the evidence for the almost universal presence of the tritubercular stage in the present or past history of the upper and lower molars, I have already advocated a distinct nomenclature for the different cusps which compose this molar and its derivatives, up to the stage of the acquisition of six tubercles in the upper molars and five in the lower. This is the final stage in which the tubercles remain distinct. The nomenclature now in general use is based, for the most part, upon the secondary or acquired position, and in no instance, so far as I know, upon the demonstrable homologies of the cusps in the upper and lower jaws. Compare for example, the molars of *Miocænus* and *Hyopsodus*. By those familiar with Cope's writings upon this subject, it will be recognized at once that the antero-internal cusp of the lower molar of *Miocænus* is not homologous with the antero-internal cusp of the upper molar of the same genus, nor is it homologous with the antero-internal cusp of the lower molar of *Hyopsodus*.

The nomenclature proposed is based upon the fact that the cusps composing the main triangles are homologous with each other and that some of the cusps superadded to these to form respectively the six and five tubercled molars, have probably originated in a similar manner. The terms for the three main cusps are selected to indicate, as far as possible, the primitive position and the order of evolution. The lower molar cusps are arbitrarily distinguished from those of the upper molars by the termination *id*.

<i>Terms proposed.</i>		<i>Terms now in use.</i>	
<i>Up. Molars.</i>	<i>Low. Molars.</i>	<i>Upper Molars.</i>	<i>Lower Molars.</i>
Protocone.	Protoconid.	Antero-internal cusp.	Antero external cusp.
Paracone.	Paraconid.	Antero-external "	Antero-internal "
			or 5th cusp.
Metacone.	Metaconid.	Postero-external "	Postero-internal "
			or intermediate "
Hypocone.	Hypoconid.	Postero-internal "	Postero-external "
		or 6th cusp.	
Protoconule.		Anterior-intermediate cusp.	
Metaconule.		Posterior-intermediate.	
		Epiconid.....	Postero-internal cusp.

This note is from an abstract of a paper presented to the British Association at Bath upon the Evolution of the Mammalian Molar

teeth. The full paper will appear in the next number of the *NATURALIST*. In the meantime I will be glad to receive suggestions or criticisms upon the above terms.—*Henry F. Osborn.*

MINERALOGY AND PETROGRAPHY.¹

PETROGRAPHICAL NEWS.—The basaltic rocks of Alsace, according to Linck,² embrace feldspathic and non-feldspathic varieties. Of the latter a limburgite from Reichenweiler contains a glassy base, which deports itself towards reagents like nepheline, a fact which would cause the rock strictly to be classed among the nepheline basalts. Its olivine yields upon analysis:—

SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	Na ₂ O
41.53	2.33	0.58	10.27	43.60	1.69,

indicating a replacement of part of the magnesium of the typical molecule by aluminium and sodium. Olivine concretions occurring in this rock consist of olivine, bronzite and a bottle-green augite containing 2.64 per cent. of K₂O and 2.41 per cent. of Na₂O.—Brief notes on the rocks of Fernando Noronha, an island in the Atlantic about two hundred miles north-east of Cape St. Roque, Brazil, are communicated from the laboratory of the Johns Hopkins University by Mr. Gill.³ The rocks described are phonolites, from conical hills similar to those in the Hegau in Baden, nepheline-basanites and basalts, nephelinite, and finally basalt glass. An extended petrographical study of these in all their different varieties will be published later.—Although the rocks of the Bohemian Mittelgebirge have been made the subjects of study by several petrographers, Hibschr⁴ finds something new to say of them in a late article in *Tschermak's Mittheilungen*. The trachytes of the region are younger than the phonolites or the basalts and occur in but a few localities. Their porphyritic sanidines possess a rounded outline and are fringed with a rim of newly formed secondary feldspathic substance. Many of the phonolites contain a large amount of plagioclase, and have besides a trachytic habit. In their cavities is often noticed quite an interesting development of secondary albite. Little crystals of this mineral extend out from the sides of the cavity and penetrate into a mass of analcite, which, together

¹ Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

² Mitth. d. Comm. f. d. Geol. Landesunters, von Elo.-Lothr., 1887, i., p. 49.

³ Johns Hopkins Univ. Circulars, No. 65, April, 1888, p. 71.

⁴ Min. u. Petrog. Mitth., 1887, p. 232.